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Variations of Dietary Trace Element Supply and its Consequences on Genomic Stability in the Murine Cerebellum

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Trace elements are essential micronutrients involved in various physiological pathways. Therefore, dysregulation in trace element homeostasis can result in a number of diseases. Trace element levels can be adapted to physiological need and nutritional supply, but only to a certain extent. Shifts in their homeostases can affect the redox status of the cell, thereby interfering with several cellular processes, among them the maintenance of genomic stability. Instead of investigating effects of isolated trace element deprivations, this work focuses on the more relevant approach to study modulated supply conditions with multiple trace elements in parallel and their consequences on DNA damage levels in the murine cerebellum. Here, the trace elements of interest are manganese, iron, copper, zinc, and selenium.

Adult male and female mice received suboptimal or adequate supply of copper, zinc, or selenium for eight weeks. Additionally, aiming to investigate trace element interactions in further detail, also combinations of dietary depletion of those three elements were fed. Trace element levels in the cerebellum were analysed via inductively coupled plasma-tandem mass spectrometry. In order to assess DNA damage levels, DNA strand breaks and alkali-labile sites were determined by alkaline comet assay.

It was confirmed that the established diet was indeed suitable to reduce concentrations of copper and selenium in the murine cerebellum whereas zinc contents remained unaffected by dietary supply. Even though dietary iron was not modulated, cerebellar iron levels were influenced by copper supply. However, none of these variations showed consequences on the levels of DNA strand breaks and alkali-labile sites in the cerebellum.

This emphasizes the tight regulation of trace element homeostasis and high priority of genomic stability maintenance, especially in sensitive brain tissue.

Keywords:
Tace elements, comet assay, cerebellum.